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Experimental characterization of 3-dimensional gravity-driven fingering in a porous medium MARIE-JULIE DALBE, RUBEN JUANES, Massachusetts Inst of Tech-MIT — When water infiltrates a dry porous media, a gravity-driven instability can be observed. Water will penetrate the porous media along preferential paths, called fingers. This gravity-driven unstable multiphase flow has important implications for natural phenomena such as rainwater infiltration in soil and secondary oil migration in reservoir rocks. While several experimental and numerical studies have described the instability in 2-dimensional (2D) settings, fundamental questions remain on the morphodynamics of gravity fingering in 3D. We developed a 3D experimental set-up based on planar laser-induced fluorescence of index-matched fluids that allows us to image this phenomenon dynamically. We study the impact of some crucial parameters such as rainfall rate or grain size on the finger size and velocity. In addition, experiments in stratified media reveal interesting dynamics of finger flow across material interfaces, an essential aspect towards the understanding of water infiltration in soils.

Marie-Julie Dalbe
Massachusetts Inst of Tech-MIT

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